

Abstract: Interstage Flammability Analysis Approach

The Interstage of the Ares I launch platform houses several key components which are on standby during First Stage operation: the Reaction Control System (ReCS), the Upper Stage (US) Thrust Vector Control (TVC) and the J-2X with the Main Propulsion System (MPS) propellant feed system. Therefore potentially dangerous leaks of propellants could develop. The Interstage leaks analysis addresses the concerns of localized mixing of hydrogen and oxygen gases to produce deflagration zones in the Interstage of the Ares I launch vehicle during First Stage operation. This report details the approach taken to accomplish the analysis. Specified leakage profiles and actual flammability results are not presented due to proprietary and security restrictions. The interior volume formed by the Interstage walls, bounding interfaces with the Upper and First Stages, and surrounding the J2-X engine was modeled using Loci-CHEM to assess the potential for flammable gas mixtures to develop during First Stage operations. The transient analysis included a derived flammability indicator based on mixture ratios to maintain achievable simulation times. Validation of results was based on a comparison to Interstage pressure profiles outlined in prior NASA studies. The approach proved useful in the bounding of flammability risk in supporting program hazard reviews.